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Stormwater Credits for Trees: Vermont Case Study

Quick facts

Where: State of Vermont
When: Adopted in 2017 in the Vermont Stormwater Management Manual Rule
What:

- Volume reduction credit in State stormwater permits.
- Three tree Best Management Practice (BMPs): Reforestation (active and passive), single tree planting.
- Companion local crediting framework for smaller sites not covered by State permit.

Overview

The effort to include trees and forests as key components of green stormwater infrastructure has been championed by the State forestry agency, Vermont Department of Forests, Parks and Recreation, for a number of years. Starting in 2010, the State's Agency of Natural Resources convened private and public stakeholders in a green infrastructure roundtable that resulted in strategic plans and initiatives to promote low impact development and green stormwater infrastructure (GSI) across State agencies, local governments, and professionals.

As a component of this effort, the State forestry agency secured a Federal grant that advanced several strategic actions, including hiring a green infrastructure coordinator within the State's stormwater agency (Department of Environmental Conservation) who helped facilitate the adoption of new policies and practices. Through the grant, a consultant was also hired to complete a comprehensive review and set of recommendations on options to credit trees within the State's stormwater management framework.

During this time, the upcoming revision of the State's stormwater management manual provided a key window of opportunity to advance the green infrastructure recommendations into policy. The initial draft version of the manual included stormwater credits for reforestation (active and passive) but no credit for single tree plantings. In subsequent stakeholder meetings and public comment, support for a single tree credit was voiced; the State worked with partners to incorporate this into the final manual that was officially adopted in 2017. A complementary GSI Toolkit was developed to aid local governments in crediting trees and other GSI practices on smaller development sites that are not covered by the State's permitting process (Vermont League of Cities and Towns 2017).

The science behind it

To establish a sound basis for establishing stormwater credits for trees, the State forestry agency contracted with Stone Environmental, Inc., to review existing research and policy examples and draft recommendations.

Stone Environmental, Inc., developed two white papers for the project. The first, describing the stormwater management benefits of trees (Moore and others 2014a) summarizes scientific knowledge about the tree processes that affect stormwater runoff (interception, transpiration, infiltration, and pollutant removal) and reviews considerations for maximizing stormwater benefits at the tree or site scale (soil restoration, engineered tree systems, tree selection, siting, and planting practices).

The second white paper (Moore and others 2014b) reviews examples from 12 States around the country that illustrate integrating tree retention or planting practices into stormwater programs. It also reviews over a dozen examples of green infrastructure crediting/incentives at the municipal scale, including examples from Seattle, WA, Washington, DC, and Nashville, TN.

The findings from these reviews helped inform the credits that were adopted in Vermont, taking into account regulatory concerns and stakeholder input.

How the credits work—State credits

The Vermont Department of Environmental Conservation Stormwater Program issues permits for post-development runoff from impervious surfaces. Permits are required for new development and redevelopment projects that will include more than 1 acre of impervious surfaces after construction. The 2017 Vermont Stormwater Management Manual Rule sets forth the treatment standards that must be met and the approved methods for calculating treatment volume (Tv) credits for the suite of structural and nonstructural stormwater treatment practices (i.e., BMPs) used onsite (Vermont Agency of Natural Resources 2017). Using the hydrologic condition method set forth in the manual, a suite of practices must be implemented to achieve the "hydrologic condition volume," which is calculated as the difference between the pre- and post-development site runoff for the 1-year, 24-hour storm.

The three types of State tree credits established under the reforestation nonstructural practice are summarized as follows:

1. **Active reforestation** involves planting a stand or block of trees, or individual trees, at a project site with the explicit goal of establishing a mature forest canopy or distributed cover that will intercept rainfall, increase evapotranspiration rates, and enhance soil infiltration rates.
   Tv credit = 0.1 inches x reforested area (i.e., 1 acre of reforested area = Tv credit of 363 cubic feet)
2. **Passive reforestation** consists of protecting a portion of a project site from mowing and allowing native vegetation to reestablish.
   Tv credit = 0.05 inches x practice area
3. **Single tree planting** involves planting individual trees on a project site.
   Tv credit = 5 cubic feet per tree planted (**Box 1**)

How the credits work—local credits

Many smaller scale development and redevelopment projects do not meet the greater than 1-acre impervious surface threshold, and thus do not require a State permit or involve the standard treatment practice requirements and credits described above. Because these smaller projects are governed by local ordinances, the Vermont League of Cities and Towns worked with State agencies and stakeholders to develop a **Green Infrastructure Toolkit** for local use. The Toolkit features:

- **GSI Sizing Tool spreadsheet**.
- Set of **GSI fact sheets** covering credits and criteria for 10 stormwater practices, including trees.
- **Low Impact Development and Green Stormwater Infrastructure Bylaw Template** (i.e., model ordinance) that can be used or adapted into local policy.

The crediting approach for retained and newly planted trees is based on an impervious area reduction credit, which in effect reduces the total volume of runoff that needs to be treated through other practices (**Box 2**). **Box 3** shows how the credits are calculated.

Box 1 Requirements for State Credits

Excerpts from the 2017 Vermont Stormwater Management Manual Rule:

REFORESTATION CREDITS

- The minimum contiguous area of active or passive reforestation shall be 2,500 square feet.
- The minimum width for reforested areas shall be 25 feet.
- The entire reforestation area shall be covered with an approved native seed mix covered with mulch to help retain moisture and provide a beneficial environment for the reforestation.
- Active and passive reforestation areas shall not be maintained as landscaped areas. Forest leaf litter, duff, and volunteer sapling and understory growth shall not be removed.
- The manual lists additional requirements regarding tree species selection, soil, slope limitations, planting plans, protection from development, and other design issues.

SINGLE TREE CREDIT

- Trees planted for the single tree credit shall be at least 2 inches in diameter at breast height (dbh) for deciduous trees, or at least 6 feet tall for conifers.

For full details on the State credits, see the 2017 Vermont Stormwater Management Manual, Section 4.2.1 (Vermont Agency of Natural Resources 2017).

Box 2 Requirements for Local Credits

The Green Infrastructure Toolkit lists a number of requirements for credit, such as:

- The tree(s) must be on the development site and within 20 feet of new and/or replaced ground-level impervious surfaces (e.g., driveway, patio, or parking lot).
- Trees must be retained, maintained, and protected on the site after construction and for the life of the development, or until any approved redevelopment occurs.
- Trees that are removed or die must be replaced with like species during the next planting season.
- See additional criteria regarding soil quality and volume and other design requirements.

RETAINED TREES

- Retained trees must be a minimum of 6 inches dbh. For trees smaller than this size that are retained, the newly planted tree credit may be applied instead.
- See additional guidelines for retained trees.

NEWLY PLANTED TREES

- New deciduous trees must be at least 1.5 inches diameter, measured 6 inches above the ground. New evergreen trees must be at least 4 feet tall.
- See additional tree selection, spacing, planting, and maintenance requirements.

For full details, see Fact Sheet #3 (**Vermont League of Cities and Towns 2015**).

BOX 3 Credit Calculation

How tree credits are calculated using Vermont's GSI Simplified Sizing Tool:

BMP	Tree Type	Impervious Area Reduction Credit
Retained Tree	Evergreen Deciduous	20% canopy area (min. 100 ft^2 / tree) 10% canopy area (min. 50 ft^2 / tree)
Newly Planted Tree	Evergreen Deciduous	50 ft^2 / tree 50 ft^2 / tree

TOTAL GROUND LEVEL IMPERVIOUS COVER: _____ sq. ft.

RETAINED TREES:

Total evergreen canopy area: _____ sq. ft.

Evergreen canopy area × 0.2 = _____ sq. ft. credit (min. 100)

Total deciduous canopy area: _____ sq. ft.

Deciduous canopy area × 0.1 = _____ sq. ft. credit (min. 50)

NEWLY PLANTED TREES:

Total new evergreen trees meeting requirements: _____

# of new evergreen trees × 50 = _____ sq. ft. credit (min. 50)

Total new deciduous trees meeting requirements: _____

# of new deciduous trees × 50 = _____ sq. ft. credit (min. 50)

TOTAL CREDIT: _____ sq. ft.

(Max 25% of proposed impervious cover)

Source: GSI Simplified Sizing Tool Fact Sheet #3 (Vermont League of Cities and Towns 2015).

References

Moore, J.; Macrellis, A.; Bailey, K. 2014b. Tree credits systems and incentives at the site scale. Montpelier, VT: Stone Environmental, Inc. 24 p. **https://vtcommunityforestry.org/sites/default/files/pictures/site_scale_tree_credits_2014_02_28_final.pdf**. (12 November 2018).

Moore, T; Barden, C; Galgamuwa, P.; Nooraei, A. [In press]. Predicting urban tree contributions to urban runoff budgets with statistical models. [Fact sheet]. Alexandria, VA: The Water Research Foundation.

Vermont Agency of Natural Resources. 2017. Vermont Stormwater Management Manual Rule. Montpelier VT: Vermont Agency of Natural Resources. 113 p. **https://dec.vermont.gov/sites/dec/files/documents/VermontStormwaterManagementManualRule_Ch36_2017_Final_2016-12-20.pdf**. (14 November 2018).

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Vermont League of Cities and Towns. 2015. Vermont green stormwater infrastructure (GSI) simplified sizing tool for small projects fact sheets. Montpelier, VT. **https://www.vlct.org/sites/default/files/documents/Resource/2015_GSI-Simplified-Sizing-Tool-Fact-Sheets.pdf**. (14 November 2018).

For more information on crediting trees in the context of stormwater management, refer to the suite of resources developed by the Center for Watershed Protection on **Making Urban Trees Count**.

Adapted from: U.S. Department of Agriculture, Forest Service. 2020. Urban forest systems and green stormwater infrastructure. FS-1146. Washington, DC. 23 p.
https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/Urban-Forest-Systems-GSI-FS-1146.pdf

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